

The effects of ownership on bank efficiency in Latin America

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The Effects of Ownership on Bank Efficiency in Latin America

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The Effects of Ownership on Bank Efficiency in Latin America

Abstract

In recent years many countries have privatized their state-owned banks and encouraged foreign investment. This paper investigates the roles of state and private ownership and foreign and domestic ownership on the performance of banks across Latin America. Using a range of financial and economic ratios, data envelopment analysis and regression modelling, the study reveals that by 2001 there was surprisingly little difference in performance between state-owned and privately-owned banks and between foreign and domestically-owned banks. The study also reports significantly different levels of bank performance in different Latin American countries, suggesting that country differences outweighed ownership differences in explaining performance.

JEL classification: G21, G32, N26

Keywords: Latin America, banking efficiency, ownership, performance

1. Introduction

Over the last decade, the banking industry in Latin American countries has undergone significant reforms. Even though the speed of change has differed across Latin America, the process of financial market liberalization has been common to most of them¹. The reforms have included the encouragement of foreign capital and the privatization of state-owned banks. There has been an increase in the share of bank assets owned by foreign investors and a greater proportion of Latin American banking operated by the private sector. For example, according to Crystal *et al.* (2002), the foreign share of assets in Latin American banking has increased by between 20% and 50% during the last decade in most countries, becoming approximately 50% in Argentina, Mexico and Venezuela and almost 60% in Peru. The drivers of reform have included a desire to raise productivity, improve services and lower costs in financial services provision.

In this paper the performance of foreign-owned versus domestically-owned and state-owned versus privately-owned banks in Latin America are compared using cross-sectional data for the year 2001, the latest date for which data were available at the time of the research. Latin America is defined widely to include South and Central America including the Caribbean. Ideally, we would also have liked to chart changes

¹ Cuba is the exception. It remains a centrally-planned economy.

in the performance of banks in Latin America under different forms of ownership during the 1990s. However, this proved not to be possible because of very incomplete data on ownership for years other than 2001. While a cross-sectional analysis of performance has limitations, since it does not reveal the dynamics of performance changes over time, nevertheless it does provide an insight into the *results* of reforms in ownership during the 1990s. If ownership change does lead to performance changes, we might expect to see obvious differences between state and privately-owned banks and foreign versus domestically-owned banks by 2001.

The outline of the paper is as follows. Section 2 surveys the existing literature on foreign versus domestic and private versus state ownership and sets out the main research hypotheses which the literature generates on ownership and performance. Section 3 discusses the data and performance measures used and Section 4 reports the empirical results. Section 5 concludes the paper and identifies the implications of the findings for future research. This paper contributes to knowledge by analyzing the efficiency of banks under different forms of ownership across a large region. In total 20 Latin American countries are included in our sample. Also, a number of previous studies examining bank efficiency have not taken into account the environment in which they operate and this may be expected to impact on performance. In this study we attempt to control for macroeconomic conditions, industry structure and the legal, regulatory and governance context in which banks operate across Latin America.

2. Literature Review and the Research Hypotheses

A number of studies have addressed the subject of efficiency in banking. Most have been country-level studies with many focusing on the US banking system. A number of these studies have emphasized the role played by better-quality management of resources in raising economic performance. For example, management of resources was found to be more important than scale and scope economies in determining bank performance by Berger (1993; also see Peristiani, 1996; Berger and Mester, 1997; Mukherjee *et al.*, 2001; Barr *et al.*, 2002; Akhigbe, 2002). By contrast, there have been relatively fewer studies concerned with cross-country analyses of bank efficiency (Berger and Humphrey, 1997). Important exceptions are Allen and Rai (1996), who tested for input and output inefficiencies in 15 countries, and Altunbas *et al.* (2001), who modelled costs using a sample of EU countries. More recently, Maudos *et al.* (2002) and Weill (2003) have also examined EU banking and cost and profit efficiency and Figueira *et al.* (2004) have compared the performance of Polish and UK banks.

In particular, there appear to have been very few studies of the performance of banks in Asia, Africa, Latin America and Central and Eastern Europe. While Claessens and Glaessner (1998) compared profitability in banking in Asia and Kwan (2003) studied unit costs in banks in seven Asian countries, the majority of papers have tended to be mainly descriptive - setting out the kinds of reforms introduced into banking but with

very limited analysis of the performance results (Peek and Rosengren, 2001; Juan-Ramón *et al.*, 2001). Where econometric modelling has been applied, the literature lacks a direct comparison between the banking systems in each country and the region as a whole (Clarke *et al.*, 2001; Fuentes and Vergara, 2003; Gruben and McComb, 2003; Majnoni *et al.*, 2003, Mercan *et al.*, 2003 and Unite and Sullivan, 2003).

As a consequence of deregulation and market liberalization, debate has emerged as to whether the ownership structure of financial institutions plays a significant role in determining efficiency (Unite and Sullivan, 2003; Fuentes and Vergara, 2003; Clarke *et al.*, 2003; Kocenda and Svejnar, 2003; Barth *et al.*, 2003, Koeva, 2003). A recent survey of a large number of privatization studies, covering a range of industries, concluded that privatization does lead to performance improvements (Megginson and Netter, 2001), but interestingly it reported only two studies specifically concerned with the banking sector. One by LaPorta *et al.* (2000) reported a negative impact of state ownership on the development of financial systems and economic growth, especially in poor countries. The other by Verbrugge *et al.* (2000) is concerned mainly with banking in OECD countries and finds some benefits from privatization in terms of profitability, fee income, capital adequacy and leverage ratios. More recently, Berger *et al.* (2003) also claim that privatization did improve bank performance in Argentinean banks, when profit efficiency is considered; however, they also found a lack of cost improvement.

The case for believing that private ownership is superior to state ownership in creating managerial incentives to raise productivity and lower costs of production is largely based on *principal-agent theory* and *public choice theory* (Clarke *et al.*, 2005; Beck *et al.*, 2003). Under principal-agent theory, managers face greater incentives to pursue profit maximization strategies than managers in the state sector because the private capital market is a superior monitor of management behaviour than government departments (Hrovatin and Uršič, 2002; Rowthorn and Chang, 1993; Boycko *et al.*, 1996; Ohlsson, 2003). Public choice theory is complementary, suggesting government ministers and civil servants pursue vote and budget maximization goals that lead to waste and other inefficiencies (Shleifer and Vishny, 1994; Bartel and Harrison, 1999, Otchere and Chan, 2003). Therefore, the first hypothesis tested by the research is:

Hypothesis 1: Banks in Latin America with private capital will operate more efficiently than banks mainly dependent on state capital.

Some studies have suggested that where there is private capital but the state remains the dominant shareholder then efficiency incentives will be diminished (Otchere and Chan, 2003). However, Fama (1980) claims that managers of state-owned firms may wish to perform well, as a result of pressure from labour markets. Fama and Jensen (1983) also argue that managers' behaviour is greatly influenced by the fact that residual claimants in state-owned firms may threaten to withdraw their resources if

not satisfied with the firm's performance. Empirical studies which have reported a superior performance of state-owned banks over their private counterparts are Bhattacharyya *et al.* (1997) for commercial banks in India and Altunbas *et al.* (2001), who show that public German banks are slightly more cost and profit efficient than their private sector competitors. Perhaps the degree of state ownership is critical.

Boardman and Vining (1989) reported in their study of 500 large non-US firms in 1983 that firms with mixed share ownership, state and private, performed less well than firms with complete private ownership and no better than those that were purely state owned. Thus full private ownership is needed to gain maximum efficiency². This leads to the second research hypothesis:

Hypothesis 2: The performance of banks in Latin America will be affected by the degree of private investment.

Turning to foreign ownership versus domestic ownership, Crystal *et al.* (2001) suggest that foreign ownership may contribute to the stability and development of developing countries' banking industries, although Clarke *et al.* (2001) and Green *et al.* (2004) suggest that inefficiencies such as capital flight may also result. Sturm and

² When considering the impact of privatisation on bank efficiency, Nakane and Weintraub (2005) have also examined the different forms of privatisation. In their paper about bank privatisation and productivity in Brazil, they claim that straight privatisation appears to be a superior strategy to restructuring, followed by privatisation.

Williams (2004) examined the impact of foreign entry on bank efficiency in Australia and concluded that foreign banks are not necessarily more profitable. Moreover, Blomström and Kokko (1998) suggested that local firms may operate more efficiently due to two main factors: domestic firms have better knowledge of local markets and institutions (which may be conducive to their better performance) and, even when foreign firms have access to better technology, spillover effects can lead domestic firms to catch up over time. By contrast, a number of studies of economic transformation in transition economies have found that the entry of foreign capital leads to major performance gains and that these can be more significant than the gains from privatizations involving simply domestic investors (Demirgüç-Kunt and Huizinga, 1999; Claessens *et al.*, 2001; Kocenda and Svejnar, 2003). The reasons for believing that foreign investment will lead to performance improvements lies in the superior management skills that foreign investors can introduce, along with more commercially-oriented goals and international capital sources. Moreover, from the examination of the Mexican banking system, Haber and Musacchio (2005) concluded that foreign banks tend to be more profitable than domestically-owned banks because they are able to charge higher service fees³. This leads to hypothesis 3.

³ Haber and Kantor (2003) went further and claimed that the lack of foreign entry at the outset of privatisation of banks in Mexico “proved fatal for the banking system” (p. 28), because banks tended to be undercapitalized and Mexican bankers had, generally, little bank management expertise.

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Hypothesis 3: Latin American banks that are foreign owned will perform more efficiently than banks that are domestically owned.

However, once again we might expect the *degree* of ownership to matter. In this case, we might expect that the larger the foreign investment is in a bank in relation to its total capital, the greater will be the efficiency gains introduced. Where foreign investors hold minority shareholdings their views could be overruled by domestic shareholders. Therefore, a further hypothesis tested in the research is:

Hypothesis 4: The larger the share of foreign capital in the total capital of Latin American banks, the higher the resulting level of efficiency achieved.

It should be noted at the outset that we recognize that the research has limitations. In particular, given that we use cross-sectional analysis, we are unable to comment upon changes in performance over time. Unfortunately, sufficient consistent data on ownership do not exist to undertake a meaningful time series or panel analysis.⁴ Also, our results could reflect sample bias. If the banks privatized were the best performers and therefore easiest to sell, and foreign investors cherry pick the best banks to invest in, then our results will be biased against a finding that state-owned and domestically-

owned banks perform relatively well. Equally, if governments privatize their worst performing banks first to reduce the fiscal burden of financing losses, and banks try harder to attract foreign investors when in desperate need of recapitalization, then the alternative bias could result. The study could be biased in favour of finding that state-owned and domestically-owned banks perform relatively well or as Green *et al.* (2004) comment: efficiency becomes “a pre-condition rather than the result of foreign entry”. These limitations need to be borne in mind when interpreting the results.

3. The Data and Performance Measures

We use data for 2001, the latest year for which we could obtain adequate detail on bank ownership in Latin America. The focus is on productive efficiency or costs of production. Data do not exist to discuss price-cost margins or service quality and therefore allocative efficiency.

The data were drawn from the Bankscope data base, which contains balance sheet and income statement data published by the London-based International Bank Credit Analysis Ltd. A number of Latin American banks in the data base had to be excluded because of gaps in data, leaving a final sample of 204 banks in 20 countries. Moreover, the data required substantial editing, in order to avoid problems associated

⁴ Some studies, e.g. Bonin *et al.* (2005) adopt a panel data analysis but using ownership data for only one year during the period covered. This approach we believe is flawed because ownership is not consistent over time in Latin America.

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with double counting of institutions, to ensure consistent accounting standards and to ensure that non-bank financial institutions were excluded from the sample. As is argued in Bonin *et al.* (2005), data obtained from Bankscope need to be dealt with carefully in order to ensure that a reliable sample has been constructed. Nevertheless, the database has been used extensively in research into banking internationally (Altunbas *et al.*, 2001; Bikker and Haaf, 2002; Bonin *et al.*, 2005) and can produce useful results, provided data entry is undertaken with care.

In 2001, the total bank assets of the countries included in the study totalled approximately US\$1,593 bn.. Our sample includes 40% of those assets, amounting to US\$632 bn.. In terms of assets, therefore, it appears that our sample is sufficiently large to offer a fairly representative picture of performance in the Latin American banking sector as a whole, although not necessarily on relative performance in every country included. Table 1 provides details of the number of banks and the percentage of bank assets included in the study for each of the 20 countries⁵. The largest concentration of banks in the study is in Brazil (73 banks). The appendix provides a summary of descriptive statistics for the data used and the performance scores reported below.

(Table 1 here.)

⁵ Argentina was excluded from the study due to the fact that it was in a severe financial crisis in 2001 and this could bias the results. Small Caribbean islands, such as Bermuda and the Cayman Islands,

Three sets of performance measures are reported. Previous performance studies have suggested that results can be sensitive to the performance measures used (e.g. Martin and Parker, 1997). By using three approaches to performance measurement, we are able to triangulate the results leading to more robust findings. The first set of performance measures is concerned with financial and economic ratios. The measures were chosen to reflect key banking metrics, namely operations, asset quality and capitalization ratios. A frequently used measure of performance in a market economy is profitability, because in a competitive market place profits reflect cost control as well as revenue maximization. Here we report three profit ratios: return on assets (ROA), interest rate spread (IRS)⁶ and net interest to total assets (NI/TA). Net interest is interest received less interest paid on deposits. However, profit is not an accurate measure of production efficiency where competition is imperfect and the banking sectors in Latin America, despite recent deregulation moves, are not necessarily highly competitive. Therefore, five other operations ratios were included, namely total costs in relation to output (TC/Y), personnel expenses over total costs (PE/TC), overheads over total assets (OV/TA), output to total assets (Y/TA) and operating income to total assets (OI/TA). Operating income differs from output by excluding interest income. Output was calculated by adding total loans to total other earning assets. In addition, the quality of bank assets was assessed using an asset quality ratio

were also excluded because of the atypical environment in which their banks operate, dealing largely with international funds.

of loan loss provisions and other provisions to total assets (P/TA). Finally, the ratio of equity to total capital (E/TA) was calculated to reflect the soundness of a bank's capitalization.

In addition to the use of performance ratios, performance was assessed using data envelopment analysis (DEA) and Stochastic Cost Frontier analysis (SCF).⁷ DEA was first proposed by Charnes *et al.* (1978) on the assumption of constant returns to scale (CRS). Banker *et al.* (1984) extended the DEA model to allow for variable returns to scale (VRS). DEA uses a piece-wise-linear technology, which involves mathematical programming to establish the efficiency frontier. The efficiency of each unit (e.g. bank) is then established by measuring its position in relation to this frontier. Assume that there are M inputs and S outputs, for each of N banks. The efficiency estimates can be obtained by solving the following DEA linear programming problem:

$$\text{Min}_{\theta, \lambda} \theta$$

subject to

$$-y_i + Y\lambda \geq 0$$

⁶ The method to calculate interest rate spread was adopted from Unite and Sullivan (2003, p.2329) and involves calculating the difference between the ratio of interest income on loans to total loans and the ratio of interest expense on total deposits to total deposits.

⁷ A translog cost function analysis was also estimated using restricted Seemingly Unrelated Regressions, to allow for the influence of the cost share equations, derived from the Shepard's lemma, as $SH_i = \frac{\partial \ln C}{\partial \ln w_i} = \beta_i + \sum_{j=1}^3 \beta_{ij} \ln(w_j) + \sum_{n=1}^2 \rho_{in} \ln(y_n)$, where $i = 1, 2$ and SH_i denotes the two cost shares functions. The results obtained are in line with those obtained from the DEA and SCF

$$\theta x_i - X\lambda \geq 0$$

$$N_N' \lambda = 1 \text{ (convexity constraint)}$$

$\lambda \geq 0$, θ is a scalar and N_N is an $N \times 1$ vector of ones.

where x_i is the column vector for the i -th bank in the $M \times N$ input matrix, X , and y_i is the column vector for the same bank in the $S \times N$ output matrix, Y . The difference between the CRS and VRS formulations resides in the convexity constraint. While in a CRS model a bank may be benchmarked against banks of different size, in a VRS model an inefficient bank is only benchmarked against banks of similar size. Therefore, λ weights will sum to a value that will usually differ from one.

The DEA approach has the advantage over a stochastic cost function analysis in that it does not require the prior specification of the functional form. This can be important where the functional form may be expected to vary, perhaps, for example, for banks across Latin America. However, DEA has the disadvantage of attributing all deviations from the efficiency frontier to production inefficiency. If any noise is present in the data due to measurement error, this will affect the position of the frontier and, as a consequence, the measurement of inefficiencies. DEA results are also easily biased by outliers in the data because they too can affect the position of the frontier.

analyses reported below. For reasons of space we do not report these results, but they can be obtained from the authors.

In this paper we concentrate mostly on the analysis of the cost structure of banks and therefore the DEA model presented uses an input orientation, where banks should minimize the use of inputs, given a certain amount of outputs produced. Only the VRS results are reported because we would expect banking to be subject to variable returns to scale – an expectation which is confirmed by our cost function results.

A stochastic cost frontier (SCF) measure was also used because it does not have the same difficulties as DEA in terms of outliers and noise in the data (Battese and Coelli, 1995). This method uses statistical estimation in order to establish an efficiency frontier and, as a result, it provides the possibility to measure inefficiencies of firms which are away from the frontier. Using SCF, we consider that Total Costs are a function of the output (y), the price of inputs (w), the level of cost inefficiency in production (u) and a random part (v). The latter includes measurement error, random factors on the value of the output variables and the effects of unspecified input variables in the cost function (see Coelli *et al*, 1998). The terms u and v are considered to be multiplicatively separable from the other variables and the variables are expressed in logarithms. Therefore, the cost function can be represented as:

$$\ln C = f(y, w) + \ln u + \ln v . \quad (1)$$

Cost efficiency for an individual bank is the ratio between the minimum cost (C^{min}) necessary to achieve a desired level of output and the observed total cost (C) and can be written as:

$$\text{Cost efficiency} = \frac{C^{\min}}{C} = \frac{\exp[f(y, w)] \exp(\ln v)}{\exp[f(y, w)] \exp(\ln v) \exp(\ln u)} = \exp(-\ln u) \quad (2)$$

The equation estimated in this paper is based on a flexible form of a translog cost function, as suggested by Casu and Girardone (2002)⁸ and can be described as:

$$\begin{aligned} \ln C = & \alpha + \sum_{i=1}^3 \beta_i \ln w_i + \frac{1}{2} \sum_{i=1}^3 \sum_{j=1}^3 \beta_{ij} \ln(w_i) \cdot \ln(w_j) + \sum_{n=1}^2 \gamma_n \ln(y_n) + \frac{1}{2} \sum_{n=1}^2 \sum_{m=1}^2 \gamma_{nm} \ln(y_n) \cdot \ln(y_m) \\ & + \sum_{i=1}^3 \sum_{n=1}^2 \rho_{in} \ln(w_i) \cdot \ln(y_n) + \ln v + \ln u \end{aligned} \quad (3)$$

Restrictions of symmetry and linear homogeneity are imposed on the input prices. The variables included in the model are total cost, which includes financial and operating costs (C), input prices which include price of labour (w_1), price of physical capital (w_2) and price of loanable funds (w_3), and quantity of outputs, described as loans (y_1) and other earning assets (y_2).

Unlike DEA, however, SCF modelling requires *a priori* determination of the functional form and the distribution of the error term. Given that we use data from 20 different Latin American countries (which may have different functional forms), we expected that this could cause some difficulty in the interpretation of the results derived.

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4. The Empirical Results

The performance ratios

Table 2 presents the financial and economic ratios with the results classified according to different levels of state and private as well as domestic and foreign ownership. To test hypotheses 1 and 2 above, relating to the effects of private ownership, we distinguished between banks which are totally privately owned; banks where the amount of assets owned by the state is less than 50% of the total assets; and banks where the majority of assets, at least 50%, are owned by the state. There were too few banks in each category for statistical analysis if we broke down state ownership into more discrete categories.

(Table 2 here.)

The Table also reports the results according to whether banks have some foreign capital and according to the degree of foreign investment, to test our research hypotheses 3 and 4. In the latter case, we distinguished between purely domestically-owned banks; banks where the total amount of foreign-owned assets is less than 50% of the total; and banks with majority, at least 50%, foreign-ownership.

In Table 2 average (av.) figures and standard deviations (s.d.) are given. The standard deviations confirm considerable dispersion of data amongst banks in the different

⁸ The translog cost function is based on a flexible form production function that places few restrictions on the underlying production technology. It is, therefore, the most appropriate cost function to use

categories. Two-tailed t-tests were therefore undertaken to determine whether the difference between the means for each of the performance measures was statistically significant at the 10% level or better.

Starting with the cost ratios, the results suggest that total costs to total output (TC/Y) are lower where there is some state ownership. The result is statistically significant for all levels of state ownership compared to private ownership. The results also confirm that there is no statistically significant differences in overheads to total assets (OV/TA) between privately-owned and state-owned banks, but personnel expenses to total costs (PE/TC) are higher in banks with majority state ownership.

The ratio of output to total assets (Y/TA) can help provide information on banks' revenues in the absence of data on bank pricing. As the results in Table 2 show, the ratio is higher in privately-owned banks than when banks are less than 50% state owned. In this case, these banks have an appreciably lower ratio than wholly privately-owned banks, suggesting that they are less effective in maximizing their revenues. However, there appear to be no statistically significant differences for this efficiency measure between privately-owned and majority state-owned firms. Concerning the ratio of operational income to total assets (OI/TA) and all of our profit measures, differences between state and private banks are not statistically significant. Therefore, we cannot conclude that these banks have substantially

when studying firms that may have differing production technologies.

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different performances in terms of generating operating income from their assets and profitability.

Regarding the asset quality ratio, namely loan loss provisions and other provisions to total assets (P/TA), this was found to be the same in privately-owned banks and in banks with over 50% state ownership, though there was some evidence of a slight statistically significant difference between private banks and banks with minority state ownership. Concerning the capital ratio, equity to total assets (E/TA), the results in Table 2 suggest that banks which are minority state owned perform worse than banks which are either privately owned or have at least 50% state ownership and this difference is statistically significant. Therefore, the results suggest that banks which are minority state owned are under-capitalized compared with other banks. On balance, however, the performance ratio results in Table 2 suggest that comparing banks across Latin America, those that are privately owned do not perform obviously better than banks which have majority or minority state ownership.

Table 2 also reports the performance ratios in terms of the degree of foreign ownership of banks. In terms of cost ratios, domestically-owned banks tend to have lower costs as a percentage of output produced and this difference is statistically significant when we compare domestic banks with banks that are at least 50% foreign owned. However, the latter have a statistically significant lower personnel expenses to total assets than domestic banks. The ratio of overheads to total assets is similar

between domestic and majority foreign-owned banks, but significantly higher in banks with minority foreign ownership.

Concerning the revenue ratios, namely output to total assets (Y/TA) and operational income to total assets (OI/TA), and the profitability ratios return on assets (ROA), interest rate spread (IRS) and net interest to total assets (NI/TA), and the capital ratio (E/TA), differences between domestically-owned banks and banks with foreign ownership are not statistically significant. Regarding the quality of assets ratio – loan loss provisions and other provisions to total assets (P/TA) - the ratio for domestically-owned banks is slightly lower than for banks which are less than 50% foreign owned but not compared to banks that are majority foreign owned.

In summary, the performance ratios for domestically-owned versus foreign-owned banks are very similar, suggesting few differences in performance. It is possible, however, that our results for domestic and foreign ownership and state and private ownership mask important differences within each of the Latin American countries. Perhaps private ownership and foreign ownership have more obvious effects in some of the economies. To test for this, we computed the same performance ratios for a number of the countries separately. This could not be done for all of the countries because, as shown in Table 1, for some countries we have limited data. The countries considered were Brazil, Chile, Colombia, Jamaica, Panama, Peru, Uruguay and Venezuela. The results obtained for each country were generally consistent with the pattern shown in Table 2 and described above – i.e. at the individual country level

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there was also no strong evidence from the performance ratios that privately-owned banks performed differently to state-owned banks or domestically-owned to foreign-owned banks in terms of costs, revenue, profitability, asset quality and capital ratios⁹.

The DEA and SCF results

As a cross-check on the conclusions from the performance ratios, the same data base was used to assess performance using DEA and SCF techniques. Table 3 provides a summary of the results obtained using DEA. The input variables consisted of labour costs, non-labour costs (total operational costs excluding personnel expenses), capital costs and interest expenses (to reflect the costs of raising loanable funds). The capital costs were proxied by calculating interest charges on total assets, using the deposit rate as the appropriate interest charge. The deposit rate was available for all 20 countries unlike other interest rates that we might have used.¹⁰ The result is admittedly a crude capital input indicator and may not accurately reflect the opportunity cost of bank financing. However, it was the best proxy we could achieve with the available data. Two output variables were considered, namely loans and other earning assets. The results for both CRS and VRS DEA models were calculated and although we only report the VRS results, the pattern of results was consistent

⁹ The detailed results can be obtained from the authors.
¹⁰ The interest rate data were extracted from the IMF’s database, *International Financial Statistics*.

using CRS modelling.¹¹ The ownership categories for both state ownership and foreign ownership are the same as those that were used when analyzing the performance ratios, above.

As the DEA results in Table 3 indicate, there is some suggestion that banks with some state ownership have a slightly higher average efficiency scores than banks which are entirely privately owned, but the differences are not statistically significant. Turning to the results for domestically-owned versus foreign-owned banks, there is statistical evidence (at the 10% level of confidence) that domestically-owned banks are more efficient than banks under majority foreign ownership.

(Table 3 here.)

Table 3 also provides a summary of the results using SCF analysis. The results are broadly consistent with the set of DEA results, but with higher overall efficiency scores (something to be expected given that SCF, unlike DEA, distinguishes inefficiency in production from random error). Again, there is no statistical evidence that state banks underperform in relation to their private counterparts. Also, domestic banks appear to perform better than banks with minority foreign ownership and this result is significant at the 5% level.

¹¹ The CRS results can be obtained from the authors.

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The next stage of the study is an analysis of performance across countries. Table 4 presents two sets of results, based on average DEA efficiency scores for banks in eight of the 20 countries in our sample¹². These eight countries are the ones with the largest number of banks for which we have data. For the other countries, there were too few banks to carry out this stage of the statistical analysis. Firstly, the table shows how privately-owned banks perform in relation to state-owned banks, and how domestically-owned banks perform in relation to foreign-owned banks in the eight countries. Secondly, Table 4 also shows how bank performance differs across countries, by considering Brazilian banks as the benchmark.¹³

From an examination of the results within each of the eight countries, we can conclude that there are no significant differences between banks which are majority state-owned and privately-owned banks. This conclusion is valid across all countries for which the comparison is possible¹⁴. Also, at the individual country level, domestically-owned banks seem to be more cost efficient than banks with at least 50% foreign ownership in Chile and Colombia.

Concerning bank performance differences across countries, banks in Chile, Jamaica and Uruguay tend to exhibit statistically different cost efficiency scores from

¹² SCF results are also available on this. However, as the results obtained provide generally similar conclusions to those obtained by DEA, they are not reported here. They are available from the authors at the reader's request.
¹³ Brazilian banks are used as a benchmark in the analysis due to the fact that Brazil is the biggest economy in Latin America.

Brazilian banks: Chilean banks seem to consistently outperform Brazilian banks in all the different ownership categories considered; while Jamaican and Uruguayan banks tend to exhibit noticeably lower performance than Brazilian banks irrespective of ownership.

(Table 4 here.)

The overall conclusion from the DEA analysis seems to be that at the aggregate, Latin American, level there are few statistically significant input-output performance differences across different ownership forms, but that at the individual country level some differences arise. This suggests that aggregating regional data conceals national variations. In order to investigate national effects further, the DEA efficiency scores were next regressed on a range of bank-specific and country-level environmental variables. Bank-specific variables were chosen to reflect the ownership structure, bank size and whether the bank is a specialized government credit institution. Beyond country dummies, country-level environmental variables were also used to indicate the size and strength of a country's financial system (number of banks, the total amount of total assets in the banking system and the ratio of bank assets to national GDP); the level of competition in banking (the three and five firm concentration ratios and the Herfindhal index¹⁵ were used); and a number of macroeconomic

¹⁴ In four out of the eight countries presented, the sample does not include banks which are at least 50% state owned.

¹⁵ These were computed from the Bankscope data and therefore correctly only reflect concentration within the sample of banks included.

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indicators, because bank performance can be expected to be affected by the state of the economy (namely nominal GDP per capita, real GDP per capita, nominal GDP growth, real GDP growth and the inflation rate). However, only some of the country dummies and the Herfindahl index proved to be statistically significant and therefore only the results for these variables are reported.

In addition, a number of regulatory governance variables were included to capture the efficiency and effectiveness of the regulatory environment, which may have a significant effect on the performance of banks. These measures were obtained from two different sources: the World Bank and the Heritage Foundation in association with the Wall Street Journal. Together they provide 16 possible indicators. These variables were initially included in this stage of the regression analysis, but most proved to be statistically insignificant. Table 5 presents a summary of the significant results using restricted ordinary least squares regressions, with the DEA and SCF efficiency scores as the dependent variable in each of the sets of estimated results presented and the environmental variables and governance indicators that proved to be statistically significant as the independent variables. The indicators that proved statistically significant are the informal market (reflecting services supplied in the informal economy), government intervention in the economy (which reflects, among other things, government consumption and production as a percentage of the economy and the extent of state control of businesses), regulatory quality (which takes into consideration the existence of policies that may hinder the operation of

markets), fiscal burden of government (which considers the top marginal income and corporate tax rates as well the change in the ratio of government expenditure to GDP) and voice and accountability (reflecting the political process, civil liberties and political rights).

(Table 5 here.)

The DEA results in Table 5 suggest that banks which operate in Brazil and Panama tend to exhibit higher cost efficiency. Moreover, the coefficient of the *Herfindhal index* is small but positive, meaning that banks which operate in a more competitive environment tend to be more cost efficient. Also, the *informal market* variable is negatively related to bank efficiency; that is, as more transactions take place in the informal economy bank performance is reduced. This result is consistent with the notion that banks operate better where economic transactions take place in the formal economy – informal economies tend to be predominantly cash based. Turning to the *government intervention* variable, the result suggests that the more government interferes with production and consumption in the economy, the less well banks perform. The significance of the *regulatory quality* variable suggests that the better the quality of regulation in a country, the more efficient are its banks. Moreover, the negative effect of the *voice and accountability* variable on bank efficiency suggests that a country with greater political stability, and where civil liberties and political rights are better protected, have more efficient banking. In this case a lower score equates with more favourable conditions because of the way the indicator is

computed. Finally, *state ownership* and *foreign ownership* were also included in the regressions as dummy variables. Both once again proved not to be statistically significant. This indicates that the regulatory and competitive environment in which banks operate was more important than a bank's ownership structure in explaining performance variations across banks in Latin America in 2001¹⁶.

The results obtained, using the SCF score as a dependent variable are generally consistent with the first set of results. In addition, the coefficients of two other country dummies are also positive and statistically significant – Colombia and Venezuela. The results also show that operating as a specialized government credit institution, on average, affects cost performance negatively. The variable *fiscal burden of government* also proved to be statistically significant. Not surprisingly, its coefficient is negative, denoting that that higher tax rates and government spending hinder the ability of businesses and individuals to pursue their objectives in the marketplace. Two variables have been excluded from the reported SCF results – the *Herfindhal index* and *Regulatory Quality* – because they were not statistically significant.¹⁷

¹⁶ Country variables for Colombia and Panama and institutional variables for specialized governmental credit institutions and the fiscal burden of the government were included in an alternative regression but were statistically insignificant. These results are not reported.

¹⁷ In both sets of estimated results, some of the variables have been excluded. They proved to be statistically insignificant in the initial estimation of the models and were therefore dropped. A restriction test on each set of estimation was carried out and confirmed the validity of the restrictions imposed.

The next step in our investigation was to re-run the earlier DEA and SCF models including the significant environmental and governance variables as inputs, given that they were shown to be correlated with bank efficiency. These results were consistent with the previous findings and neither private nor foreign ownership had a statistically significant effect on bank performance. For reasons of space we do not report these results in detail but they can be obtained from the authors.

6. Conclusions

This study has looked at the relative performance of state-owned and privately-owned and domestically-owned and foreign-owned banks across 20 Latin America countries, using cross-sectional data for 2001. Some previous studies (e.g. Megginson and Netter, 2001) have suggested that private ownership leads to improved production efficiency. Equally, other studies (Litan *et al.*, 2001) have argued that foreign ownership can improve the management of assets in emerging economies. Triangulating the evidence using a set of commonly-used financial and economic performance ratios in banking, DEA and SCF analyses, the overall conclusion is that there is no strong evidence that privately-owned banks in Latin America performed better than their state-owned counterparts in 2001. However, there is some evidence that foreign-owned banks did not perform as well as their domestically-owned counterparts. The study also found that differences in performance were more related

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to the national regulatory and economic environment and therefore to the country in which the banks operate than to ownership.

Table 6 provides a summary of the results in terms of the four research hypotheses. In the main, none of our research hypotheses was supported. At the same time, we recognize that the study has some weaknesses. The Bankscope database was used in the absence of a better alternative source. The use of this database meant that, in particular, only a cross-sectional analysis could be undertaken because of a lack of ownership data for years other than 2001. This means that we were unable to trace the impact of ownership changes over time. This is important because, while there may be no robust performance differences between privately-owned and state-owned and domestically-owned and foreign-owned banks in 2001, it could be that private banks and foreign banks achieved the largest efficiency *gains* over the previous years. This would be so if the banks privatized and those sold to foreigners were banks with the worst performance. This needs further research. Another weakness relates to the limited number of banks that could be included in the study for some of the 20 countries because of missing data. Perhaps the inclusion of more banks would have affected the results.

Nevertheless, the research findings are important given the public policy agenda, promoted by international organizations such as the World Bank, to encourage privatization and foreign involvement in the Latin American economies (World Bank, 1995; Saha and Parker, 2001). The findings do not suggest that improving bank

performance is simply a matter of changing ownership. Rather, the causes of bank performance seem to be found in wider economic and regulatory issues, although this needs much fuller investigation than has been possible in this paper. Future research could usefully focus on the macroeconomic and regulatory regimes necessary to promote maximum performance within Latin American banking.

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Table 1: Data on the size and number of Latin American banks included in the sample

Countries	Total Assets (thousand US\$)	Sample Assets (thousand US\$)	Assets included (%)	Total number of banks
<i>Belize</i>	785,800	403,750	51	2
<i>Bolivia</i>	4,663,309	3,136,530	67	5
<i>Brazil</i>	616,241,990	452,701,344	73	73
<i>Chile</i>	67,994,986	42,831,957	63	14
<i>Colombia</i>	379,499,925	21,093,064	6	17
<i>Costa Rica</i>	11,183,671	3,732,710	33	9
<i>Cuba</i>	1,327,675	657,322	50	2
<i>Dominican Republic</i>	14,869,316	1,720,636	12	3
<i>Ecuador</i>	6,369,667	1,051,500	17	4
<i>El Salvador</i>	9,738,165	3,848,600	40	4
<i>Guyana</i>	349,881	295,040	84	2
<i>Honduras</i>	3,691,461	1,021,171	28	3
<i>Jamaica</i>	7,442,236	3,205,342	43	10
<i>Mexico</i>	348,046,236	58,055,401	17	3
<i>Panama</i>	41,085,644	10,672,615	26	14
<i>Paraguay</i>	2,541,103	566,442	22	3
<i>Peru</i>	22,686,336	13,290,635	59	11
<i>Suriname</i>	227,326	225,314	99	2
<i>Uruguay</i>	23,267,699	1,864,400	8	13
<i>Venezuela</i>	30,715,535	11,710,518	38	10

Table 2: Performance ratios for the Latin American banks studied

Banks	Total Costs/ Output (TC/Y)	Overheads/ Total Assets (OV/TA)	Personnel Expenses/ Total Costs (PE/TC)	Output/ Total Assets (Y/TA)	Operational Income/ Total Assets (OI/TA)	Return on Assets (ROA)	Interest Rate Spread (IRS)	Net Interest/ Total Assets (NI/TA)	Loan Loss Provisions/ Total Assets (P/TA)	Equity/ Total Assets (E/TA)
	av. (s.d.)	av. (s.d.)	av. (s.d.)	av. (s.d.)	av. (s.d.)	av. (s.d.)	av. (s.d.)	av. (s.d.)	av. (s.d.)	av. (s.d.)
<i>Private</i>	0.35 (0.70)	0.06 (0.06)	0.15 (0.09)	0.85 (0.10)	0.10 (0.09)	1.88 (3.74)	0.26 (1.15)	0.07 (0.06)	0.02 (0.03)	0.16 (0.13)
<i>Less than 50% state</i>	0.18 (0.07)***	0.06 (0.02)	0.23 (0.14)	0.77 (0.10)**	0.08 (0.04)	1.13 (1.94)	0.15 (0.13)	0.06 (0.02)	0.01 (0.01)*	0.12 (0.06)*
<i>50% or more state</i>	0.21 (0.09)**	0.08 (0.05)	0.21 (0.14)**	0.84 (0.12)	0.10 (0.07)	-0.26 (6.11)	0.19 (0.39)	0.06 (0.07)	0.02 (0.03)	0.17 (0.13)
<i>Domestic</i>	0.19 (0.10)	0.06 (0.05)	0.17 (0.10)	0.85 (0.11)	0.10 (0.09)	2.01 (4.44)	0.31 (0.96)	0.07 (0.06)	0.01 (0.02)	0.17 (0.15)
<i>Less than 50% foreign</i>	0.25 (0.18)	0.11 (0.11)*	0.17 (0.08)	0.84 (0.06)	0.14 (0.12)	0.62 (3.44)	0.18 (0.16)	0.09 (0.09)	0.03 (0.05)*	0.15 (0.12)
<i>50% or more foreign</i>	0.55 (1.01)***	0.06 (0.04)	0.14 (0.10)*	0.84 (0.11)	0.10 (0.07)	1.32 (3.74)	0.19 (1.35)	0.07 (0.05)	0.01 (0.02)	0.15 (0.12)

av – arithmetic mean, s.d. – standard deviation.

Significance at: ***1% level, ** 5% level, * 10% level.

Table 3: The DEA and SCF efficiency scores

Banks	Total no.	DEA score	SCF score
		av. (s.d.)	av. (s.d.)
<i>All</i>	202	58.26 (28.72)	80.19 (6.62)
<i>Private</i>	171	58.06 (29.38)	80.24 (6.65)
<i>Less than 50% state</i>	7	60.65 (15.22)	81.18 (4.46)
<i>50% or more state</i>	24	58.95 (27.71)	79.59 (7.06)
<i>Domestic</i>	100	60.47 (27.89)	80.81 (6.64)
<i>Less than 50% foreign</i>	23	67.09 (23.22)	76.63 (8.43)**
<i>50% or more foreign</i>	79	52.88 (30.46)*	80.46 (5.70)

av – arithmetic mean, s.d. – standard deviation; * significantly different from the DEA / SCF score for domestic ownership at 10% level of confidence; ** at 5% level of confidence.

Table 4: Efficiency scores of banks in selected Latin American countries, using DEA

Countries	All			Private ownership			50% or more state ownership			Domestic ownership			50% or more foreign ownership		
	Total	DEA	100%	Total	DEA	100%	Total	DEA	100%	Total	DEA	100%	Total	DEA	100%
	no.	score	eff	no.	score	eff	no.	score	eff	no.	score	eff	no.	score	eff
		av. (s.d.)	%		av. (s.d.)	%		av. (s.d.)	%		av. (s.d.)	%		av. (s.d.)	%
Brazil	73	63.25 (26.84)	26.03	60	62.13 (27.31)	25.00	9	73.08 (26.75)	44.44	40	65.01 (26.85)	30.00	26	60.05 (28.89)	26.92
Chile	14	90.52 (9.90)***	35.71	13	92.19 (7.99)***	38.46	0	-	-	6	96.77 (3.72)***	50.00	5	83.58 (4.42)***††	40.00
Colombia	17	53.82 (24.68)	11.76	10	49.95 (22.22)	0.00	7	59.35 (28.69)	28.57	11	59.54 (26.88)	18.18	4	39.38 (15.65)**†	0.00
Jamaica	10	47.82 (18.71)**	0.00	9	46.76 (19.52)**	0.00	1	57.32 (-)*	0.00	6	45.74 (13.94)***	0.00	3	46.21 (30.38)	0.00
Panama	14	74.22 (25.19)	28.57	14	74.22 (25.19)	28.57	0	-	-	4	82.75 (20.10)	25.00	10	70.81 (27.14)	30.00
Peru	11	60.35 (22.41)	9.09	7	61.27 (22.57)	14.29	4	40.6 (29.11)*	0.00	2	55.86 (40.95)	100.0	6	62.77 (24.34)	33.33
Uruguay	13	19.44 (24.76)***	7.69	13	19.44 (24.76)***	7.69	0	-	-	-	-	-	13	19.44 (24.76)***	7.69
Venezuela	10	52.28 (26.18)	10.00	10	52.28 (26.18)	10.00	0	-	-	7	54.40 (30.41)	14.29	3	47.33 (16.08)	0.00

av – arithmetic mean, s.d. – standard deviation;

Significance at: ***1% level, ** 5% level, * 10% level in relation to Brazilian banks in each bank category;

Significance at: ††† 1% level, † 10% level in relation to domestic banks in each country.

Table 5: Testing for the effects of environmental and governance factors

Dependent variable	bank DEA efficiency scores	bank SCF efficiency scores
	coefficient	coefficient
Explanatory variables (all variables are in logs)		
<i>Constant</i>	80.43 [6.30]***	77.08 [19.69]***
<i>State ownership</i>	-3.22 [-0.50]	0.82 [0.44]
<i>Foreign ownership</i>	-11.02 [-2.64]***	-0.31 [-0.30]
<i>Brazil</i>	37.31 [6.05]***	4.43 [2.37]**
<i>Colombia</i>	-	8.39 [2.76]***
<i>Panama</i>	50.55 [5.08]***	5.84 [2.73]***
<i>Venezuela</i>	-	7.99 [2.54]**
<i>Specialized governmental credit institution</i>	-	-6.40 [-2.39]**
<i>Herfindahl index</i>	0.01 [3.59]***	-
<i>Informal market</i>	-13.61 [-2.49]**	-1.63 [-1.82]*
<i>Government Intervention</i>	-13.86 [-2.84]***	-5.29 [-2.90]***
<i>Regulatory Quality</i>	19.60 [2.82]***	-
<i>Fiscal Burden of the Government</i>	-	-6.79 [-4.06]***
<i>Voice and Accountability</i>	-40.03 [-6.08]***	8.07 [3.73]***
<i>Adjusted R²</i>	0.22	0.09
<i>F-stat</i>	4.43***	2.77***
<i>DW</i>	1.87	1.98
<i>Heteroskedasticity χ^2</i>	1.41	1.72

Significance at: ***1% level, ** 5% level, * 10% level

Table 6: Summary of the results in terms of the research hypotheses

Hypotheses	Performance Ratios	DEA	SCF
Hypothesis 1: <i>Banks with private capital will operate more efficiently than banks mainly dependent on state capital</i>	Mainly rejected	Rejected	Rejected
Hypothesis 2: <i>The performance of banks will be affected by the degree of private investment</i>	Mainly rejected	Rejected	Rejected
Hypothesis 3: <i>Banks with foreign investors will perform more efficiently than banks with only domestic investors.</i>	Mainly Rejected	Rejected	Rejected
Hypothesis 4: <i>The larger the share of foreign capital in the total capital of banks, the higher the resulting level of efficiency achieved.</i>	Rejected	Rejected	Mainly rejected

Appendix: Descriptive statistics

<i>Variables</i>	<i>Mean</i>	<i>Median</i>	<i>Standard deviation</i>	<i>Minimum</i>	<i>Maximum</i>
<i>Total Costs/Output</i>	0.33	0.18	0.65	0.02	4.19
<i>Overheads/Total Assets</i>	0.07	0.05	0.06	0.01	0.42
<i>Personnel Expenses/Total Costs</i>	0.16	0.15	0.10	0.01	0.50
<i>Output/Total Assets</i>	0.84	0.87	0.11	0.49	1.00
<i>Operational Income/Total Assets</i>	0.10	0.08	0.09	-0.03	0.68
<i>Return on Assets</i>	1.58	1.44	4.58	-26.39	20.80
<i>Interest Rate Spread</i>	0.25	0.12	1.07	-6.24	8.77
<i>Net Interest/Total Assets</i>	0.07	0.05	0.06	-0.03	0.40
<i>Loan Loss Provisions/Total Assets</i>	0.02	0.01	0.03	-0.03	0.26
<i>Equity/Total Assets</i>	0.16	0.12	0.13	0.04	0.98
<i>Loans</i>	1287565	242202	3867937	1	36201388
<i>Other Earning Assets</i>	1318617	139257	4329080	16	36717289
<i>Labour Costs</i>	75592	8762	267987	48	2431046
<i>Non Labour Costs</i>	103172	11501	339657	1	2558654
<i>Interest Costs</i>	291068	46738	831211	22	5619635
<i>Capital Costs</i>	201815	9922	792005	1	9914373
<i>DEA score</i>	58.26	54.29	28.72	3.91	100.0
<i>Price of Labour</i>	10.90	2.84	16.78	0.01	87.84
<i>Price of Capital</i>	4.72	0.18	5.35	0.06	16.22
<i>Price of Deposits</i>	1.32	0.10	14.96	0.02	212.60
<i>SCF score</i>	80.19	81.09	6.62	50.90	94.11
<i>Herfindhal index</i>	892.81	521.49	799.25	465.37	6425.37
<i>Informal market</i>	3.39	3.50	0.64	1.50	5.00
<i>Government intervention</i>	2.73	3.00	0.47	1.00	4.00
<i>Regulatory Quality</i>	0.47	0.36	0.49	-0.96	1.35
<i>Voice and Accountability</i>	0.41	0.53	0.47	-0.59	1.31
<i>Fiscal Burden of the Government</i>	2.91	2.50	0.62	1.50	4.50